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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/579,511

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EXAMINER

RAYMOND, BRITTANY L

ART UNIT

PAPER NUMBER

1722

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DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/579,511	Applicant(s) SANDSTROM, TORBJORN	
	Examiner BRITTANY RAYMOND	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 5/16/2006; 3/30/2007; 4/2/2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 May 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>7/9/2007</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. Figures 5 and 6 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 1-8, 10, 14, 18, 23 and 24 are objected to because of the following informalities: Regarding claim 14, the word, "non-polarised," should be "non-polarized." As to claims, 1-8, 10, 18, 23 and 24, the use of dashes makes the claims indefinite and they need to be changed to sentence form. Also, the use of bullets or letters to list parameters is indefinite and should be changed to sentence form. For example, claim 2 should state something similar to, "selecting a combination of values of radiation bandwidth, pulse length and radiation flash frequency so that a calculated illumination non-uniformity (3 sigma) from speckle amounts to less than 0.5%" Appropriate correction is required.

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Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
4. Claims 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (U.S. Patent 4970546).

Suzuki discloses an illuminating optical system for performing an optimization process comprising: means for moving a speckle pattern formed by the irradiation of a pulse on a reticle or wafer, means for storing the minimum number of pulses required to substantially smooth the speckle pattern on the second object by irradiation of plural pulses, and means for determining the number of pulses required for obtaining desired exposure, the amount of light of each pulse, and the number of pulses for moving the speckle pattern by a cycle based on the stored minimum number of pulses (Col. 2, Lines 53-67), as recited in claims 23, 24 and 26 of the present invention. Suzuki also discloses that the process is performed to produce a uniform illumination intensity (Col.

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2, Lines 43-47), which would produce critical dimensions on the patterned substrate, as recited in claims 23-26 of the present invention. Suzuki states that the process is performed until the unevenness in the illumination intensity caused by the speckle on the wafer has been almost eliminated (Col. 14, Lines 48-56), as recited in claim 25 of the present invention.

Suzuki fails to disclose that the cost of patterning is determined, and that the number of pulses is determined on a layer to layer basis.

Suzuki discloses that the object of the invention is to provide the illumination control device capable of providing illuminating light with improved uniformity in intensity and without speckle fringes, by means of a simpler structure (Col. 2, Lines 47-52), as recited in claims 24 and 26 of the present invention. Suzuki also discloses that the exposure is performed on a wafer coated with a photoresist to form a semiconductor device (Col. 1, Lines 19-25), as recited in claims 23-26 of the present invention.

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have determined the cost of patterning of the process because Suzuki teaches that a simpler exposure process is desired, which means that a cheaper exposure process is desired, thus leading to the cost of the system having to be determined. It also would have been obvious to one of ordinary skill in the art, to have determined the number of pulses on a layer to layer basis because Suzuki teaches that the exposure process forms a semiconductor device, which is known to be formed of several layers. Since no speckle is desired in the final product of Suzuki, it would have

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been obvious to one of ordinary skill in the art to prevent speckle from each one of the layers used to form the final product.

5. Claims 1-9 and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (U.S. Patent 4970546) in view of Furman (U.S. Patent Publication 2004/0146295).

The teachings of Suzuki have been discussed in paragraph 4 above. Suzuki teaches every limitation of dependent claims 9 and 27-29 of the present invention. Suzuki also discloses that the pulsed laser has a mechanism for reducing the bandwidth (Col. 4, Lines 17-22), as recited in claims 2 and 7 of the present invention. Suzuki states that the light can be controlled by changing the zooming ratio or aperture diameter (Col. 4, Lines 58-66), as recited in claims 3 and 8 of the present invention. Suzuki also states that changing the frequency of pulses can be used to obtain a substantially uniform illumination intensity (Col. 7, Line 67-Col. 8, Line 6), as recited in claim 2 of the present invention. Finally, Suzuki teaches that the light amount and time of each pulse are determined (Col. 7, Lines 11-15 and Col. 8, Lines 43-52), which can be used to determine a pulse length, as recited in claims 2 and 6 of the present invention.

Suzuki fails to disclose that the radiation source is partially coherent.

Furman discloses that both coherent and partially coherent radiation sources produce speckle (Paragraph 0181), as recited in claims 1 and 4-8 of the present invention.

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have performed the process of Suzuki using a partially coherent exposure system, as suggested by Furman, because Furman teaches that partially coherent sources produce speckle as well, which is an undesired effect of an exposure system.

6. Claims 10-14 and 18-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (U.S. Patent 4970546) in view of Furman (U.S. Patent Publication 2004/0146295) and Jain (U.S. Patent 6717650).

The teachings of Suzuki have been discussed in paragraph 4 above. Suzuki teaches every limitation of dependent claims 11-13 and 19-21 of the present invention. Suzuki also discloses that the polarizer may be employed (Col. 7, Lines 5-11), which means that the light does not necessarily have to be polarized, as recited in claims 14 and 22 of the present invention.

Suzuki fails to disclose that the radiation source is partially coherent, and that a scanner system with an optical field larger than 10 mm or a maskless scanner system with an optical field larger than 0.5 mm is used.

Furman discloses that both coherent and partially coherent radiation sources produce speckle (Paragraph 0181), as recited in claims 10 and 18 of the present invention.

Jain discloses providing a lithography technique of maskless, seamless, small-field large-area scanning with sub-pixel resolution achieved through sub-threshold voting exposures (Col. 2, Lines 20-24), as recited in claims 10 and 18 of the present

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invention. Jain also discloses that the voting exposure can be defined by the number of pulses (Col. 3, Lines 33-40), as recited in claims 10 and 18 of the present invention.

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have performed the process of Suzuki using a partially coherent exposure system, as suggested by Furman, because Furman teaches that partially coherent sources produce speckle as well, which is an undesired effect of an exposure system. It also would have been obvious to one of ordinary skill in the art, to have performed the process of Suzuki using a maskless scanner with a small optical field, as suggested by Jain, because Jain teaches that these scanners also change the number of pulses to determine a desired exposure process.

7. Claims 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (U.S. Patent 4970546) in view of Furman (U.S. Patent Publication 2004/0146295) and Jain (U.S. Patent 6717650) as applied to claims 10-14 and 18-22 above, and further in view of Shiozawa (U.S. Patent Publication 2001/0052968).

The teachings of Suzuki, Furman and Jain have been discussed in paragraphs 4 and 6 above.

Suzuki, Furman and Jain fail to disclose that refractive optics are used, that at least one diffractive element is used, and that catadioptric optics are used.

Shiozawa discloses a laser scanning system that can be a catadioptric system and have a diffractive optical element used in combination with lenses (Paragraph 0063), as recited in claims 15-17 of the present invention.

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have used a catadioptric optics with a diffractive element in the system of Suzuki, Furman and Jain, as suggested by Shiozawa, because Shiozawa teaches that laser scanning systems used in the formation of semiconductor devices commonly use these optics to control the amount of light that reaches that substrate.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRITTANY RAYMOND whose telephone number is (571)272-6545. The examiner can normally be reached on Monday through Friday, 9:00 a.m. - 5:30 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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**/Kathleen Duda/
Primary Examiner, Art Unit 1795**

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